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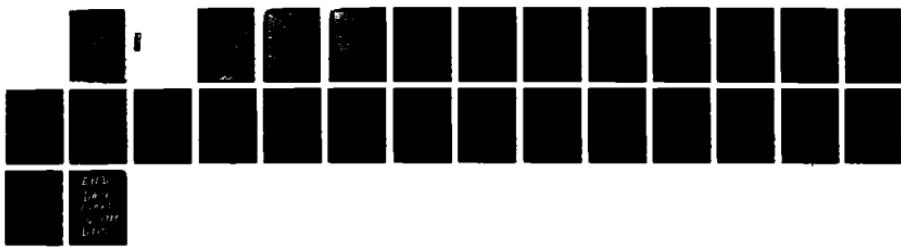
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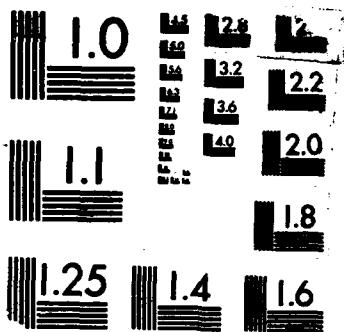
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Exercise Patterns in the U.S. Navy

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This document has been approved
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INTRODUCTION

In the military community, exercise is recognized as an important preventive measure to promote health, prevent disease, and achieve and maintain levels of physical fitness necessary to meet the challenges presented by extreme environments and sustained operations. However, little is known about the frequency or duration of exercise participation or the sociodemographic distribution of exercise activity. Such information would be useful for monitoring changes in exercise activities related to health promotion efforts and for identifying groups who might benefit most from interventions to increase activity levels.

Objectives

Study objectives were to (a) document the exercise activities of U.S. Navy personnel, and (b) identify sociodemographic and environmental factors associated with exercise intensity.

Approach

Participants were Navy personnel on active duty during 1985 who had been randomly selected for participation in a Navy-wide evaluation of the Health and Physical Readiness Program. Volunteers included 2704 men and 334 women who had completed a "lifestyle" questionnaire as part of this evaluation. Variables examined were self-reports on the frequency and duration of 10 common exercise activities, exercise intensity (i.e., estimated total kilocalories expended per week), and a number of demographic, lifestyle, and attitudinal variables including sex, age, race, education, smoking, caffeine and alcohol consumption, belief in the importance of being fit, perceived instrumentality of exercise, childhood athletic experience, and perceived command support for exercise.

Results

Although approximately six percent of the sample was completely inactive, most individuals reported participating in several exercise activities. The leading activities included walking, running, calisthenics, weight lifting, swimming, and bicycling. Although this order of participation was generally similar to findings from national surveys, running achieved a considerably higher ordinal position among Navy personnel, who participated in virtually all exercise activities at a higher rate than did the U.S. population.

Navy personnel expended an average of 1999 kcals per week in exercise activities. A multiple regression analysis indicated that exercise intensity

...and was also associated by perceived importance of being fit, exercise intensity, age, and smoking behavior--the latter two in a

negative direction. Older personnel were generally more active than similarly aged individuals in the private sector. The most salient determinant of exercise intensity was a positive attitude toward being fit. However, it is unclear whether attitudes toward fitness are an antecedent or consequence of exercise involvement. The positive association between athletic participation as a youth and exercise activity as an adult is consistent with previous findings. The negative association between age and exercise activity has also been well documented; however, it is not possible to conclude from cross-sectional data whether older people are less active because of the biology and sociology of aging or because they were raised in a generation less inclined to be physically active. The relatively modest, negative association between smoking behavior and exercise intensity in the present study is consistent with other findings and supports an intuitively appealing assumption that exercise and smoking are incompatible behaviors. Future results of this longitudinal effort may provide more conclusive information on the adoption and maintenance of various exercise activities.

A number of environmental factors, such as shipboard versus shore-based assignment, geographic region, and perceived command support of exercise were not significant determinants of exercise intensity. It may be that the Navy-wide organizational requirements for physical fitness have served to override other potential determinants of exercise activity. The Navy's health promotion and physical fitness initiatives have helped create an environment in which health and physical readiness have been afforded an unequivocal, high priority, are assessed routinely, and have direct and far-reaching career implications. The relatively high levels of exercise participation among the U.S. Navy personnel may be attributable to these initiatives.

EXERCISE PATTERNS IN THE U.S. NAVY

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Within the military, exercise activity has generally been promoted to achieve and maintain levels of physical fitness necessary to meet the challenges presented by extreme environments and sustained operations. A growing body of literature, however, indicates that increased physical fitness may be only one of many beneficial effects associated with increased physical activity. The preventive aspects of physical activity are, perhaps, the best documented. Although physical inactivity is most closely identified as a primary risk factor for coronary heart disease (1-5), it has also been implicated in the susceptibility to, or treatment of, other health problems, such as hypertension (6), obesity (7), osteoporosis, (8), low back pain (9), diabetes mellitus (10), and psychological distress (11).

The potential benefits of increased exercise activity, however, are not limited to health promotion and disease prevention. There is some evidence to suggest that increased exercise activity is associated with other salutary outcomes such as productivity (12-13), reduced absenteeism (14-15), reduced health care and disability costs (16), and positive mood and psychological functioning (17-19). These and other factors have led to substantial increases in the number of exercisers in the U.S. population in recent years (20).

Although there are a number of problems in estimating the prevalence of physical activity from national surveys (21-22), Stephens, Jacobs, and White (20) reviewed the literature and concluded that (a) approximately 20 percent of the U.S. population exercise with an intensity and frequency generally recommended for cardiovascular benefit, and (b) an additional 40 percent are active at a more moderate level, perhaps sufficient to receive some health

benefits. Among those who exercise, national surveys indicate that walking, swimming, calisthenics, bicycling, jogging-running, bowling and softball are the activities which account for the largest numbers of participants (20). However, little is known of the frequency or duration of this exercise participation or the sociodemographic distribution of exercise activity.

Surveys of general leisure-time physical activity have begun to explore demographic, social, and environmental associations; however, these determinants remain poorly understood (23). One of the most consistent findings in this area is that physical activity generally declines with age (20,23,24). However, most of these data are cross-sectional and may overestimate the effect of aging because they do not address the potential contributions of cohort or generational factors.

In addition to age, surveys have also assessed the effects of sex, socioeconomic status, and race on leisure-time physical activities. Sex differences in physical activity are generally modest and somewhat dependent upon the definition of physically active. In a review of the literature, Stephens and his colleagues (20) concluded that males and females were equally likely to participate in conditioning activities (such as walking, bicycling, and calisthenics), but males were more likely to be involved in sports, intense activities, or activities performed frequently. Socioeconomic status, as defined by income, education, and occupation has demonstrated a modest positive association with leisure-time activity, but the limited data which are available on race have shown no effect (20).

Much of the literature on relationships between social or personal factors and physical activity has focused on childhood athletic experiences, health-related attitudes and beliefs, and motivation. Engstrom (25), for example, maintains that adult involvement in physical activity is an expression of (a) prior experience of sport and physical activity, (b) the individual's attitude, and (c) the individual's current personal situation. In a study of the impact of prior experience upon the current activity of middle-aged men, Harris (26) reported that active individuals were more likely to have been members of athletic teams or to have participated in physical activity while in college. While Dishman and his colleagues (23) generally conclude that exercise or sport experience in youth can be a strong agent in influencing exercise behavior in adults, they further observe that its

influence is frequently overridden by other personal and environmental factors.

Individuals who place a high value on exercise, believe in personal control over health outcomes, and expect personal health benefits from exercise are also more likely to engage in exercise (23,27). In addition, individuals who are self motivated or have a generalized tendency to follow through with behavioral decisions are more likely to continue exercise programs in clinical, corporate, and community settings (23,27,28).

Environmental factors, including barriers to exercise and geographic region, have been explored, but their relationships with exercise activity remain inconclusive. The primary perceived barriers to exercise include lack of time, distance from facilities, lack of energy, lack of will power, and medical problems (23,29,30). However, as Dishman et al. (23) point out, perceived barriers may frequently reflect inadequate motivation rather than actual reasons for inactivity. Analyses of regional differences in activity levels in the United States and in Canada have generally found the largest proportion of exercisers are in the West, the smallest proportion are in the South, and an intermediate proportion reside in the East or Northeast (20,31,32). These differences, however, may have their primary bases in economic circumstances rather than climatic variations (20,33). While climate influences choices and seasonal feasibility of outdoor leisure activities (30,34), the extent to which climate affects overall activity level remains unknown (23).

Although participation in regular and vigorous physical activity is positively associated with a variety of healthful outcomes and has been identified as a national priority (35), available survey data are more distinguished by quantity than quality (20), and the determinants of physical activity remain poorly understood (23). Within the military community, large scale survey data on exercise activity are virtually nonexistent. Therefore, the specific objectives of the present study were to (a) document the exercise activities of U.S. Navy personnel, and (b) identify sociodemographic and environmental factors associated with exercise intensity.

Methods

Participants

Subjects were 2704 men and 334 women who had completed a "lifestyle" questionnaire as part of a Navy-wide longitudinal evaluation of the Navy's Health and Physical Readiness Program. Their average age was 28.3 years (S.D. = 7.0) with a range from 17-59 years. Average years of school completed were 12.9 (S.D. = 1.9) with a range from 8-22 years. Enlisted personnel comprised 88.4% and officers 11.6% of the sample. The median paygrade was E-5 with a range from E-1 to O-6. Of 2,750 individuals who identified their race/ethnic group, there were 79.6% Caucasian, 11.4% Black, 4.8% Hispanic/Puerto Rican, and 4.2% Malayan/Filipino. Participants were classified as living in one of seven regional areas based on duty assignment: (a) northwest United States (12.8%), (b) southwest United States (25.5%), (c) northeast United States (10.6%), (d) southeast United States (38.2%), (e) midwest United States (1.6%), (f) foreign region with warm climate (7.5%), and (g) foreign region with cold climate (3.8%).

Procedures

Sampling Procedures. Participants were randomly selected from Navy personnel on active duty during 1985. Selecting the sample was a two-step process. First, 119 command units were randomly selected from approximately 5,000 existing in the Navy. Second, individuals were randomly selected from each of the 119 command units. To select individuals within the 119 command units, March 1985 computerized personnel tapes from the Naval Military Personnel Command were used. Up to 60 individuals were selected from each command.

Data collection procedures. Points of contact (POCs) were provided for 110 of the 119 originally targeted units: five transient personnel commands did not conduct the physical readiness test, a primary component of the overall longitudinal study; one submarine was decommissioned; one fighter squadron had conflicting operational demands; and one shore command and one aerial refueler squadron could not accommodate study requests. POCs for the 110 participating commands were asked to distribute and collect completed

questionnaires from all of the identified participants at their respective commands.

Questionnaire

The questionnaire included a broad range of items which addressed a variety of health- and fitness-related behaviors, attitudes, values, and perceptions. The specific variables examined in this report included the following:

Caffeine and alcohol consumption. Weekly alcohol consumption was computed as the product of the reported number of days on which the respondent drank alcohol during the previous week and the usual number of drinks taken per day. Respondents answered three separate questions concerning the average number of caffeinated soft drinks, cups of caffeinated coffee, and cups of caffeinated tea they consumed daily. Total caffeine intake, in milligrams, was estimated for each person using a table of caffeine content of selected foods (36): a cup of coffee was assigned 100 mg of caffeine, a cup of tea, 50 mg, and a 12 oz cola, 45 mg. Average daily caffeine intake was computed by multiplying the reported number of cups or drinks of each beverage by the appropriate number of milligrams of caffeine, then summing across all three beverage types.

Smoking. Smoking was assessed by requesting that respondents indicate the average amount of cigarettes, cigars, or pipefuls of tobacco smoked per day using a 10-category response scale: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, and 41+. Respondents were also asked to indicate whether they were a (a) non-smoker, (b) light smoker, (c) moderate smoker, or (d) heavy smoker.

Exercise. An estimate of total kilocalories expended per week in physical exercise was also computed for each person. Respondents were given a list of ten types of physical activity (running, bicycling, swimming, racket sports, continuous walking, aerobics, calisthenics, weight lifting, basketball and, baseball/softball) and asked to estimate (a) how many times per week they engaged in that activity (frequency), and (b) how many minutes they generally spent in one workout period for each activity (duration). Kilocalories expended per minute were assigned for each activity using the tables of energy expenditure in McArdle, Katch, and Katch (37). The number of kilocalories

required for each exercise (except baseball/softball which was not provided in the McArdle et al. table) was multiplied by the total time in minutes per week that the respondent reported engaging in that activity (frequency X duration), then summed across all activities for a weekly estimate of exercise-related energy expenditure. This value was then used as an index of exercise intensity.

Importance of being fit. Respondents estimated the personal degree of importance of the following aspects of health and fitness: (a) regular exercise, (b) physical fitness, (c) good health, (d) physical attractiveness, and (e) reach or maintain "ideal" weight. Estimates were made on a scale ranging from 1 ("Not at all important") to 5 ("Extremely important"). The five estimates were averaged to form a scale score. The internal consistency (alpha) of the scale was .83.

Instrumentality of exercise. Respondents estimated the likelihood "for you personally" that exercise leads to six different outcomes: (a) better physical appearance, (b) weight control, (c) better overall health, (d) better physical fitness, (e) better physical fitness test scores, and (f) doing one's Navy job better. Estimates were made on an 11-point scale with 10 point intervals ranging from 0 ("Never"), through 100 ("Always"). Responses on the six items were averaged to form a scale score with an internal consistency (alpha) of .91.

Command support for fitness. Respondents rated their command on five items relevant to organizational support for individuals achieving and/or maintaining high levels of physical fitness. These items pertained to whether the command provided: (a) sufficient time and opportunity to exercise in addition to performing work duties, (b) enough space and equipment to exercise, (c) enough low-calorie foods for the diet-conscious, (d) enough physical fitness programs and activities, and (e) effective weight control programs. Responses were made using a 7-point scale ranging from 1 ("Absolutely not/never") to 7 ("Always are/enough"). Item responses were averaged to form a scale with an internal consistency (alpha) of .78.

Athletic as a youth. Three items were included to assess participants' tendencies to be physically active as a youth. Two items asked directly how "athletic" participants were (a) as a child and (b) as a teenager. Responses

were made using a 6-point scale from 1 ("Not at all") to 6 ("Extremely athletic"). A third item asked how often respondents participated in organized sports or athletic activities during high school. Responses were made using a 6-point scale from 1 ("Never") to 6 ("All the time"). Item responses were averaged to form a scale with an internal consistency (alpha) of .90.

RESULTS

Although approximately six percent of the sample* was completely inactive, the majority of individuals reported participating in a number of exercise activities (Table 1). As shown in Table 2, the leading exercise activities included walking, running, calisthenics, weight lifting, swimming, and bicycling. Although this order of participation was generally similar to findings from previous surveys, the level of participation among U.S. Navy personnel in the present study was substantially higher, and running achieved a considerably higher ordinal position.

Table 1.
Distribution of Participation in Multiple Exercise Activities

<u>Number of Exercise Activities</u>	<u>Percent of Sample</u>
0	6.2
1	8.1
2	11.5
3	14.1
4	15.9
5	14.6
6	13.4
7	7.6
8	5.0
9	2.8
10	.7

*On a previous item, 98 individuals indicated that they had not been "exercising regularly" during the past month or the period immediately prior to one month ago and then failed to complete any of the items which assessed the frequency and duration of the ten exercise activities. Because estimates of specific exercise activity could not be obtained, these individuals were not included in the analyses. If these missing responses were interpreted as zeros, approximately 10 percent of the sample would be considered completely inactive.

Table 2.^a
Percentage of population participating in specified leisure-time activities.

U.S. Navy (1985), U.S. and Canada 1972-1983.

Activity	U.S. NAVY		UNITED STATES				CANADA	
	NHRC ^b	PCPFS	NHIS	Perrier	NSPHPC	Miller Lite	PEAS	Canada Fitness Survey
Walking	75	40	34	22	37	...	40	57
Swimming.....	41	17 ^c	24	17	26 ^c	33	32	36
Calisthenics....	53	13	14	14	27	29	19	28
Bicycling.....	40	17	11	13	11	28	13	38
Running.....	69	6	5	11	12	29	15	31
Bowling.....	...	12	16	13	...	10	4	8
Softball.....	33	5	9	7	...	21	2	11
Gardening ^d.....	...	...	...	...	...	...	...	30
Tennis.....	27 ^e	5	11	9	...	12 ^e	13	15
Golf.....	...	6	8	5	...	6	11	13
Dancing ^d.....	...	...	...	...	...	...	...	13
Weight lifting..	48	...	...	...	...	...	...	...

^aReproduced in part from Stephens, T., Jacobs, J.R., and White, C.C. A descriptive epidemiology of leisure-time physical activity, Public Health Reports, 1986, 100(2), 147-158 with permission of the journal.

^bPresent study results.

^cRefers to swimming in summer only.

^dScarcity of data makes ranking very tenuous.

^eIncludes squash, other racquet sports.

NOTE: Acronyms for studies are defined in Appendix A

The individuals in this study expended an average of 1999 kcals per week in the ten exercise activities which were assessed. As shown in Figure 1, the distribution of exercise intensity was positively skewed. Although the mode of this distribution (19%) expended less than 500 kcals per week in exercise, the overall exercise intensity of the U.S. Navy personnel in this survey was considerably higher than the activity levels reported in U.S. and Canadian national surveys (20). In the Health Promotion and Disease Prevention Survey of the 1985 National Health Interview Survey, for example, Schoenborn (38) used type of activity, frequency, and duration to classify leisure time physical activity levels by kilocalories expended per kilogram per day. Using these estimates, respondents were classified as being sedentary (0.0-1.4 kcal/kg/day), moderately active (1.5-2.9 kcal/kg/day), or very active (3.0 or more kcal/kg/day). Using the same rigorous criterion, the men and women in the U.S. Navy sample were considerably more active than the U.S. population within each of the age classifications represented (Table 3).

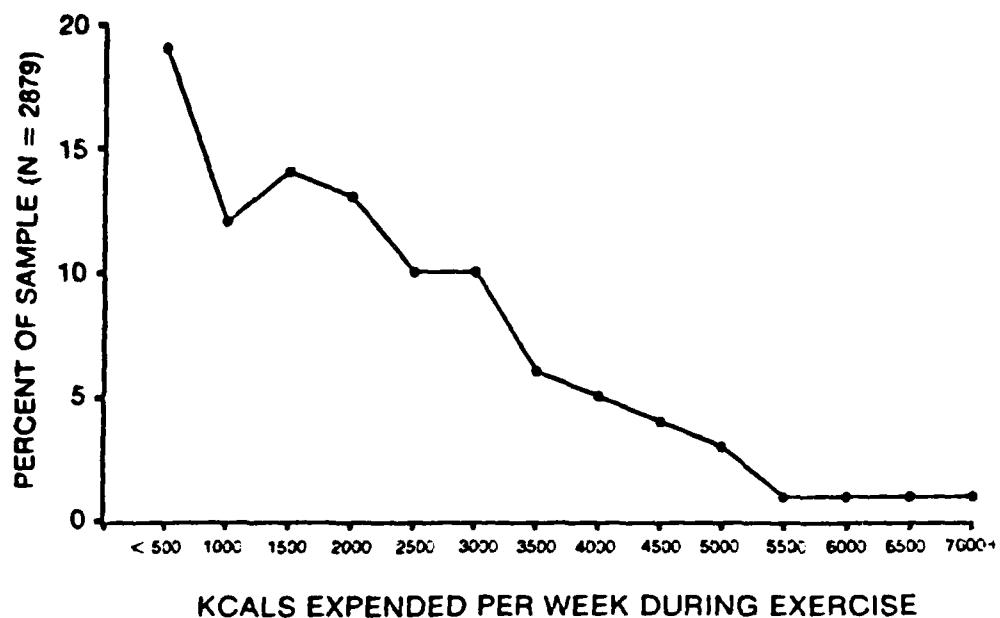


Figure 1. Frequency distribution of exercise intensity (Kcals/week).

Table 3.

Percent Distribution of U.S.^a and Navy Exercise Intensity Levels By Sex and Age

	MEN								WOMEN							
	ACTIVITY LEVEL ^b				ACTIVITY LEVEL				ACTIVITY LEVEL				ACTIVITY LEVEL			
	Sedentary		Moderately Active		Very Active		Sedentary		Moderately Active		Very Active		Sedentary		Moderately Active	
Total	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY	U.S.	NAVY
Total	49.3	25.7	16.5	21.1	34.1	53.2	61.8	28.5	16.3	26.1	21.9	45.4				
Age ^c																
18-29	35.3	22.0	16.2	19.4	48.5	58.6	51.8	26.4	17.9	25.5	30.3	48.1				
30-44	48.6	31.7	18.5	23.8	32.9	44.5	58.3	32.9	18.2	28.2	23.5	38.8				
45-64	59.7	35.1	15.3	26.3	25.0	38.6	66.3	-	15.3	-	18.4	-				
65-74	54.6	-	16.7	-	28.6	-	69.9	-	15.1	-	15.0	-				
75+	73.1	-	12.7	-	14.1	-	85.2	-	8.1	-	6.8	-				

^a Data from the Health Promotion and Disease Prevention Survey of the 1985 National Health Interview Survey (N=170,971). Reproduced from Schoenborn, C.A., Public Health Reports, 1986, 101(6):571-580, with permission of the journal.

^b Activity level: Sedentary, 0.0 - 1.4 Kcal/Kg/day, moderately active, 1.5 - 2.9 Kcal/Kg/day, very active, 3.0 or greater Kcal/Kg/day.

In order to identify individual differences in exercise intensity, a number of demographic, lifestyle, and attitudinal variables were examined. The demographic variables included, sex (1=male; 2=female), age, race (1=white, 2=non-white), and years of education. The lifestyle variables consisted of amount of smoking, number of drinks of alcohol, and milligrams of caffeine. The attitudinal variables were the importance of being fit, instrumentality of exercise, the product of importance of being fit and instrumentality of exercise, childhood athletic experience, perceived command support for exercise, and duty station (1=sea; 2=shore). Pearson product moment correlations were computed between these variables and exercise intensity to determine the zero order strength of associations (Table 4). Those variables which demonstrated a significant correlation in excess of .19 with exercise intensity were then entered into a stepwise multiple regression analysis. Importance of being fit was positively correlated with instrumentality of exercise and demonstrated a stronger association with exercise intensity than either instrumentality of exercise or the product of importance of being fit and instrumentality of exercise. Therefore, importance of being fit was entered into the regression procedure along with childhood athletic experience, age, and smoking behavior. Each of these variables made a significant contribution to the prediction of exercise intensity and yielded a multiple R of .51 (Table 5).

As shown in Figure 2, exercise intensity was considerably greater among individuals who considered fitness to be very important or extremely important. Similarly, exercise intensity demonstrated a substantial increase among individuals who reported childhood athletic participation which was greater than average (Figure 3).

Table 4.

Pearson Product Correlation Matrix of Demographic, Lifestyle, and Attitudinal Variables with Exercise Intensity.

	Sex	Race ^a	Importance of Being Fit	Athletic	Duty Station
Kcal/wk (1=M;2=F)	Age (1=W;2=Non-W)	Education	Smoking	Alcohol Caffeine (IMPFIT)	Support (Athletic) INST
Kcal/wk					
Sex	.07				
Age	-.20	-.04			
Race	-.09	-.02	-.02		
Education	-.01	.10	.39	-.07	
Smoking	-.20	-.02	.00	-.09	
Alcohol	-.01	-.11	-.13	-.08	-.20
Caffeine	-.11	-.08	.06	-.13	-.11
IMPFIT	-.42	-.06	-.04	.18	-.25
INST	.23	.01	-.04	.07	.13
IMPFIT x INST	.37	.03	-.04	.13	-.14
Athlete	-.08	-.10	.10	-.03	-.03
Cmd. Support	.31	-.10	.11	.01	-.01
Duty Station	.00	-.24	-.19	.03	-.17

^aThe mean value of exercise intensity was highest for Blacks and lowest for Pacific Islanders. Therefore, race was also assessed as a dichotomy between Blacks and Non-Blacks. This did not materially affect the results.

Table 5.
Stepwise Multiple Regression Analysis Predicting Exercise Intensity

<u>Variable</u>	<u>Multiple R</u>	<u>R²</u>	<u>Beta</u>	<u>B</u>	<u>P</u>
Importance of Being Fit	.42	.17	.42	697.3	.001
Athletic as a youth	.47	.23	.22	267.2	.001
Age	.50	.25	-.11	-39.1	.001
Smoking	.51	.26	-.11	-165.3	.001
Constant = -434.9					

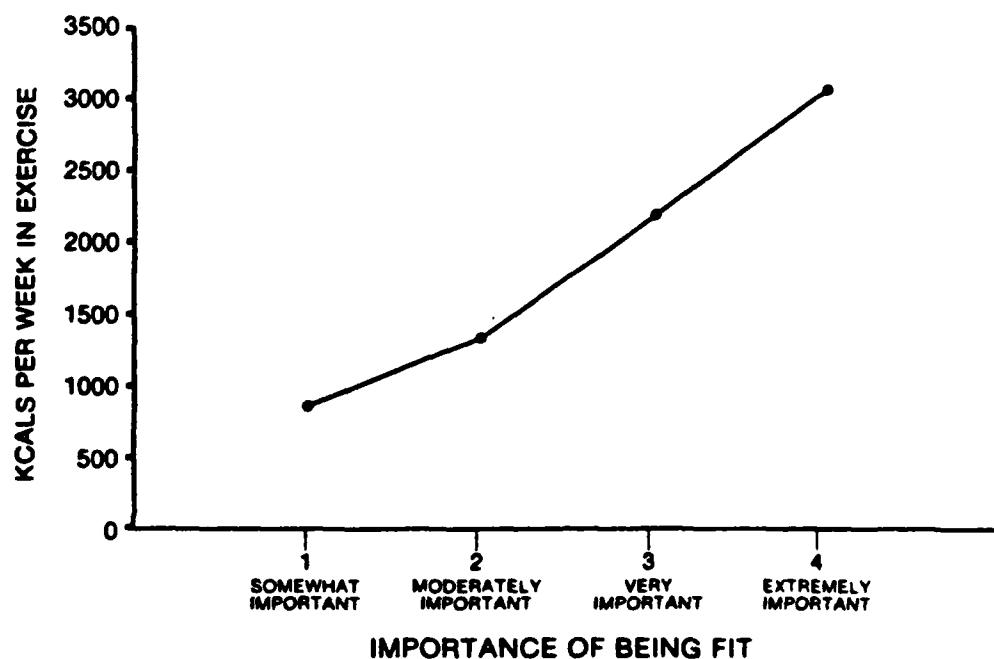


Figure 2. Levels of exercise intensity (Kcals/week) associated with ratings of the importance of being physically fit.

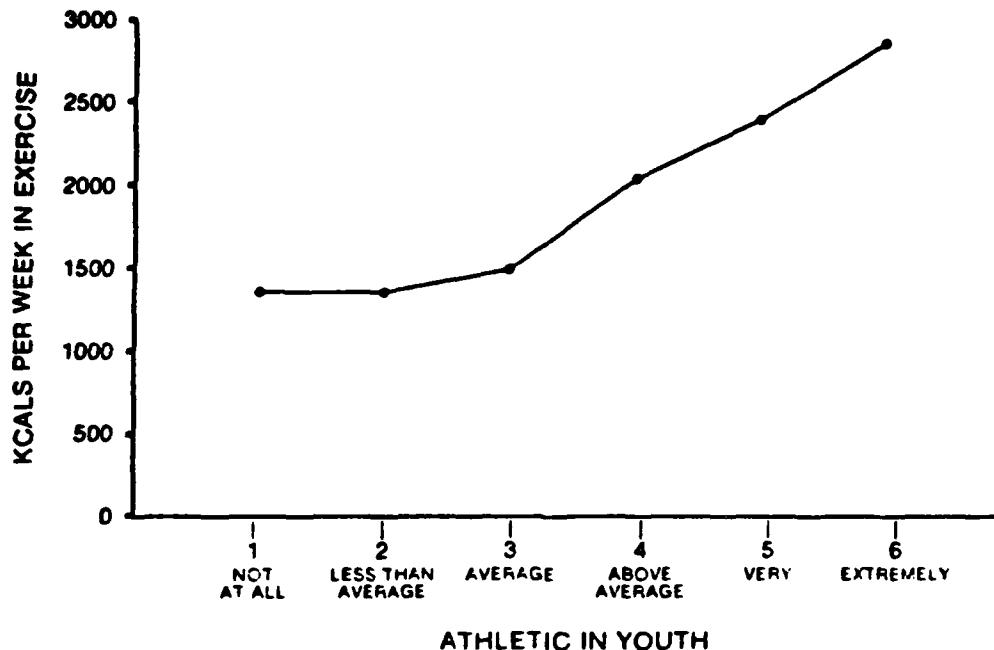


Figure 3. Levels of exercise intensity (Kcals/week) associated with being athletic as a youth.

Consistent with previous findings, exercise intensity was negatively associated with age. As shown in Figure 4, there was a generally decreasing level of exercise intensity with each advance in age. Exercise intensity was also negatively associated with smoking behavior. Individuals who were heavy or moderate smokers exercised less than light smokers or nonsmokers (Figure 5).

The relationship between the seven geographic regions and exercise intensity was assessed with a one way analysis of variance and was found non-significant [$F(6,2598)=.81$, $p > .05$]. This result did not support previous findings of greater exercise activity in the West.

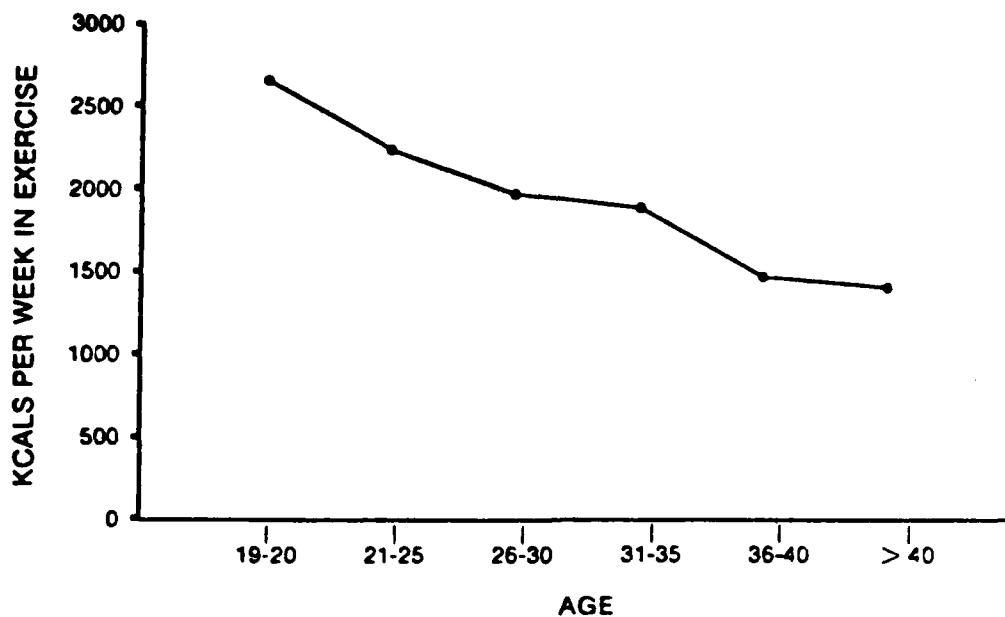


Figure 4. Levels of exercise intensity (Kcals/week) associated with age.

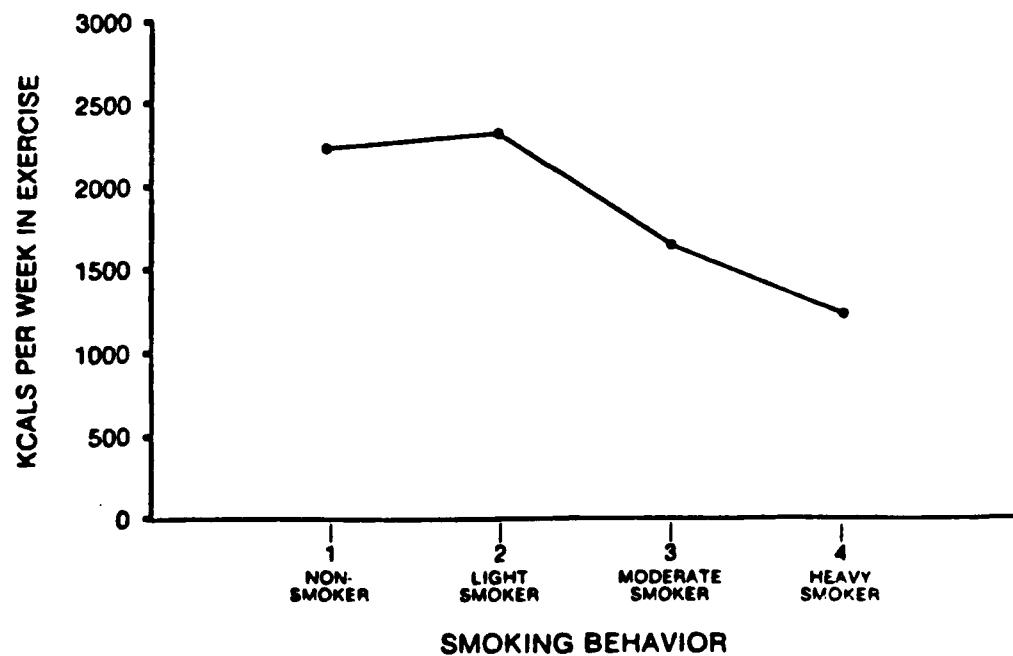


Figure 5. Levels of exercise intensity (Kcals/week) associated with smoking behavior.

DISCUSSION

The specific exercise activities pursued by U.S. Navy personnel were generally similar to the activities of the larger society. The particularly high participation rate in walking and jogging may be associated with a general awareness of the importance of aerobic activity and easy access by the greatest number of people. As Moskovites (39) points out, jogging or walking provide several important advantages: a) they are natural activities which require no real training; b) they are not dependent on seasons of the year, as are snow skiing or outdoor swimming; and c) they do not require a special facility or costly equipment. Other leading activities such as calisthenics and weight lifting may be preferred because they enhance muscular endurance, an important component of the required physical fitness test (40), and they can be performed at the individual level without reliance on partners or teams.

While the preference for particular activities was generally similar between the U.S. Navy sample and previous national survey data, the intensity of the exercise activity was higher among Navy personnel. Although the Navy represents a slightly younger subset of the population, this factor was not considered central. An examination of age specific data from the Health Promotion and Disease Prevention Survey of the 1985 National Health Interview Survey (38) demonstrated consistently lower levels of activity when compared with similar age groups in the U.S. Navy sample. The existence of a Navy-wide Health and Physical Readiness Program and a requirement to meet semi-annual physical fitness test standards probably represent more plausible explanations for the higher level of exercise intensity among U.S. Navy personnel.

The most salient determinant of exercise intensity was a positive attitude toward being fit. However, Dishman and his colleagues (23) cite evidence that there is little relationship between improving knowledge about or attitudes toward exercise and increased adherence to exercise programs. Thus, it is unclear whether attitudes toward fitness are an antecedent or consequence of exercise involvement.

The positive association between athletic participation as a youth and exercise activity as an adult is consistent with previous findings (41).

While this influence may be overridden by other personal and environmental factors (23), previous athletic experience as a youth remained an important determinant of exercise intensity in the present study.

The other factors which were associated with exercise intensity were age and smoking behavior. The negative association between age and exercise activity has been well documented (20,38); however, as Stephens and his colleagues (20) point out, it is not possible to conclude from cross-sectional data whether older people are less active because of the biology and sociology of aging or whether being raised in a generation with less leisure time, they have never been physically active off the job. The relatively modest, negative association between smoking behavior and exercise intensity in the present study is consistent with other findings (42,43) and supports an intuitively appealing assumption that exercise and smoking are incompatible behaviors (43).

It is interesting to note that a number of environmental factors, such as shipboard versus shore-based assignment, geographic region, and perceived command support of exercise were not significant determinants of exercise intensity. It may be that the organizational requirement for physical fitness standards has served to override some of the less salient determinants of exercise activity. As Dishman and his colleagues (23) point out, exercise is at once a socially and self regulated behavior. The dynamic processes which influence the adoption and maintenance of exercise behavior are complex and not well understood; however, much of the relatively high levels of exercise intensity in the U.S. Navy may be attributable to a number of organizational initiatives in the areas of health promotion and physical fitness. These initiatives have created an environment in which health and physical readiness have been afforded an unequivocal, high priority, are assessed routinely, and have direct and far-reaching career implications. Future results of this longitudinal effort may provide important additional information on the adoption and maintenance of various exercise behaviors.

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Appendix A*

Principal national surveys of leisure-time physical activity

Survey (acronym) date completed	Size (No. of persons)	Ages covered	Data collection methods	Agency conducting fieldwork
President's Council on Physical Fitness and Sports (PCPFS), 1972 (1)	3,875	22+	1 interview per household	Opinion Research Corp.
National Health Interview Survey (NHIS) Supplement, 1975 (2).....	12,000	20+	Face-to-face interview	Bureau of the Census
Fitness and Amateur Sport Canada (F&AS), 1976 (3).....	70,000	14+	Self-completed drop-off questionnaire	Statistics Canada
Perrier, 1978 (4).....	1,510	18+	Face-to-face interviews, telephone interviews of runners	Louis Harris and Associates
National Survey of Personal Health Practices and Consequences (NSPHPC), 1979 (5).....	3,025	20-64	Telephone interview	Chilton Research Services
Canada Fitness Survey, 1981 (6)	21,500	10+	Self-completed questionnaire during household visit	Canada Fitness Survey
CDC-State Behavioral Risk Factor (BRF) survey, 1982 (7).....	22,200	18+	Telephone interview	State health departments
Miller Lite, 1983 (8).....	1,139	14+	Telephone interview	Research Fore- casts, Inc.

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experience, age, and smoking behavior--the latter two in a negative direction. The Navy's health promotion and physical fitness initiatives have helped create an environment in which health and physical readiness have been afforded an unequivocal, high priority, are assessed routinely, and have direct and far-reaching career implications. The relatively high levels of exercise participation among Navy personnel may be attributable to these initiatives.

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